

CLAIMS

What is claimed is:

1. A semiconductor substrate for a microfluid ejection head, the substrate comprising:  
a plurality of fluid ejection actuators disposed on the substrate;  
5 a plurality of driver transistors disposed on the substrate for driving the plurality of fluid ejection actuators, each of the driver transistors having an active area ranging from about 1000 to less than about 15,000  $\mu\text{m}^2$ ; and  
a plurality of logic circuits comprising at least one logic transistor are coupled  
10 to the driver transistors,  
wherein each of the driver and logic transistors comprise a high density array of MOS transistors wherein at least the logic transistors have a gate length of from about 0.1 to less than about 3 microns.
2. The semiconductor substrate of claim 1 wherein the fluid ejection actuators comprise heater resistors.
3. The semiconductor substrate of claim 2 wherein the heater resistors have a resistance ranging from about 70 to about 150 ohms.
4. The semiconductor substrate of claim 1 wherein the driver transistors comprises transistors having a lightly doped drain region.
5. The semiconductor substrate of claim 1 wherein the driver transistors have an active area width ranging from about 100 to less than about 400 microns.
6. The semiconductor substrate of claim 1 wherein the logic circuits are configured to select a gate of the driver transistors for driving the ejection actuators.
7. The semiconductor substrate of claim 1 wherein the driver transistors have an on resistance of less than about 20 ohms.
8. The semiconductor substrate of claim 1 wherein the driver transistors comprise transistors having lightly doped source and drain regions.

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9. The semiconductor substrate of claim 1 wherein the driver transistors comprise transistors having a gate length ranging from about 0.1 to less than about 3 microns.
10. The semiconductor substrate of claim 1 wherein the driver transistors comprise transistors having a channel length ranging from about 0.1 to less than about 3 microns.
11. A printhead for an ink jet printer containing the semiconductor substrate of claim 1.
12. The printhead of claim 11 wherein the fluid ejection actuators comprise heater resistors and the heater resistors have a protective layer comprising diamond like carbon with a thickness ranging from about 1000 to about 3000 Angstroms.
13. A microfluid ejection cartridge for a microfluid ejection device comprising:
  - a cartridge body having a fluid supply source and an ejection head attached to the cartridge body in fluid communication with the fluid supply source, the ejection head comprising:
    - a semiconductor substrate having a plurality of fluid ejection actuators disposed on the substrate;
    - a plurality of driver transistors disposed on the substrate for driving the plurality of fluid ejection actuators, each of the driver transistors having an active area width ranging from about 100 to less than about 400 microns;
    - and
    - a plurality of logic circuits comprising at least one logic transistor operatively coupled to the driver transistors,
  - wherein each of the driver and logic transistors comprise a high density array of MOS transistors wherein at least the logic transistor has a gate length of from about 0.1 to less than about 3 microns; and

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a nozzle plate attached to the semiconductor substrate for ejecting fluid therefrom upon activation of the fluid ejection actuators.

14. The microfluid ejection cartridge of claim 13 wherein the fluid ejection actuators comprise heater resistors having a resistance ranging from about 70 to about 150 ohms
15. The microfluid ejection cartridge of claim 13 wherein the active area of the substrate for each of the driver transistors ranges from about 1000 to less than about 15,000  $\mu\text{m}^2$ .
16. The microfluid ejection cartridge of claim 13 wherein the driver transistors comprise transistors having a lightly doped drain region.
17. The microfluid ejection cartridge of claim 13 wherein the logic circuits are configured to select a gate of the driver transistors for driving the ejection actuators.
18. The microfluid ejection cartridge of claim 13 wherein the driver transistors have an on resistance of less than about 20 ohms.
19. The microfluid ejection cartridge of claim 13 wherein the driver transistors comprise transistors having lightly doped source and drain regions.
20. The microfluid ejection cartridge of claim 12 wherein the fluid ejection actuators comprise heater resistors and the heater resistors have a protective layer comprising diamond like carbon with a thickness ranging from about 1000 to about 3000 Angstroms.
21. The microfluid ejection cartridge of claim 12 wherein the driver transistors comprise transistors having a gate length ranging from about 0.1 to less than about 3 microns.

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22. A semiconductor substrate for an ink jet printhead, the substrate comprising:

a plurality of heater resistors disposed on the substrate, the heater resistors having a protective layer comprising diamond like carbon with a thickness ranging from about 1000 to about 3000 Angstroms;

a plurality of driver transistors disposed on the substrate for driving the plurality of fluid ejection actuators; and

a plurality of logic circuits comprising at least one logic transistor are coupled to the driver transistors,

wherein each of the driver and logic transistors comprise a high density array of MOS transistors wherein at least the logic transistors have a gate length of from about 0.1 to less than about 3 microns.

23. The semiconductor substrate of claim 22 wherein the heater resistors have a resistance ranging from about 70 to about 150 ohms.

24. The semiconductor substrate of claim 22 wherein the driver transistors comprises transistors having a lightly doped drain region.

25. The semiconductor substrate of claim 22 wherein the driver transistors have an active area width ranging from about 100 to less than about 400 microns.

26. The semiconductor substrate of claim 22 wherein the logic circuits are configured to select a gate of the driver transistors for driving the ejection actuators.

27. The semiconductor substrate of claim 22 wherein the driver transistors have an on resistance of less than about 20 ohms.

28. The semiconductor substrate of claim 22 wherein the driver transistors comprise transistors having lightly doped source and drain regions.

29. The semiconductor substrate of claim 22 wherein the driver transistors comprise transistors having a gate length ranging from about 0.1 to less than about 3 microns.

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30. The semiconductor substrate of claim 22 wherein the driver transistors comprise transistors having a channel length ranging from about 0.1 to less than about 3 microns.